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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Field of the Invention]This invention is excellent in the stacking tendency and precise feeling of metallic pigment, and relates to the double layer film formation method in which flip-flop (ff) nature, brightness, etc. can moreover make a good metallic paint film form.

**[0002]**

[Description of the Prior Art]The formation method of the double layer coat which has a metallic feeling by the three quart 1 baking method (3C 1B) which paints and heats an organic solvent system base coating, an organic solvent system metallic paint, and a clear coating, and makes this three-layer coat harden simultaneously is publicly known. Since the heating process for stiffening a coat can be managed at once, this method is convenient to laborsaving, but if a metallic paint is painted to the unhardened painted surface of a base coating, the stacking tendency of metallic pigment will be confused, a precise feeling is inferior, and, moreover, the fault that ff nature, brightness, etc. are not enough arises.

[0003]The purpose of this invention is to cancel the fault like the above in the formation method of the double layer coat which has a metallic feeling by 3C 1B.

**[0004]**

[Means for Solving the Problem]As a result of inquiring wholeheartedly, this invention persons use distemper as a base coating and a metallic paint this time, and are in a state where solid content content of a coat of a water base paint is 40 % of the weight or more, By recoating an aquosity metallic paint and a clear coating one by one to the painted surface, it finds out that the above-mentioned purpose can be attained and came to complete this invention.

[0005]In this way, according to this invention, a double layer film formation method which paints an aquosity thermosetting base coating (A) to a coated object, and is characterized by recoating an aquosity metallic paint (B) and a clear coating (C) one by one to the painted

surface in the state where solid content content of a coat formed is 40 % of the weight or more is provided.

[0006]Hereafter, it explains still in detail about a double layer film formation method (henceforth "this method") of this invention.

[0007]

[Embodiment of the Invention]Restriction in particular does not have a coated object which can apply this method in the shape, construction material, etc., for example, it is illustrated as what has the suitable metal of cars, such as a passenger car, a minivehicle, and a motorcycle, or body outer plate part made from a plastic. It precedes applying this method to these coated objects, chemical conversion, under coat paint, middle-coat paint, etc. may be performed using a known material and method, and the substrate with which such processing and paint were performed is also included by the "coated object" in this invention.

[0008]This method to the coated object which paints an intermediate coat etc. beforehand further by direct or the primer, and a case to these coated objects. It is the method of forming the double layer coat which paints an aquosity thermosetting base coating (A), dries suitably, is in the state where the solid content content of the coat is 40 % of the weight or more, paints an aquosity metallic paint (B) and a clear coating (C) one by one to the painted surface, and has a metallic feeling.

[0009]An aquosity thermosetting base coating (A) is a paint painted by the coated object in advance of a metallic paint (B) in accordance with this method, and is a thermosetting base coating containing an aquosity medium. A thermosetting resin ingredient, a color pigment, water, etc. are contained, and, specifically, the wet coating which can form color coating films, such as solid color tone, metallic tone, and light interference nature, is raised.

[0010]The base resin which has hydrophilic functional groups, such as cross-linking functional groups, such as a hydroxyl group, and a carboxyl group, as a thermosetting resin ingredient, such as an acrylic resin, polyvinyl resin, polyester resin, alkyd resin, and urethane resin, The coating resin composition of itself known which consists of cross linking agents, such as melamine resin and a blocked polyisocyanate compound, can be used. As for especially base resin, generally, it is preferred the acid value of the hydroxyl value of 10-200, especially 30-120 within the limits, 5-150, especially 15-100 within the limits and 2000-1 million, and to have a number average molecular weight of 3000-50000 within the limits. It is suitable that there is base resin to 60 to 80%, and the blending ratio of base resin and a cross linking agent usually has 50 to 10% of especially a cross linking agent especially in 40 to 20% of within the limits 50 to 90% based on the sum total solid content weight of both this ingredient.

[0011]Although base resin can be water-gritted or water decentralized by, for example, neutralizing the carboxyl group as a hydrophilic functional group contained in this resin, As a neutralizer for neutralizing a carboxyl group, For example, ammonia, methylamine, ethylamine,

propylamine, Isopropylamine, a butylamine, 2-ethylhexylamine, cyclohexylamine, Dimethylamine, diethylamine, dipropyl amine, diisopropylamine, Dibutyl amine, trimethylamine, triethylamine, triisopropyl amine, Tributylamine, ethylenediamine, morpholine, N-alkyl morpholine, Pyridine, monoisopropanolamine, methylethanol amine, Methyliso propanolamine, dimethylethanolamine, diisopropanolamine, diethanolamine, triethanolamine, diethylethanolamine, triethanolamine, etc. are raised. These neutralizers can be used combining one sort or two sorts or more. Within the limits of 0.1-2 Eq and 0.3-1.2 Eq is [ amount of the neutralizer used ] usually suitable to the carboxyl group in base resin.

[0012]As a color pigment, solid color paints, metallic pigment, light interference nature paints, etc. are included, and the thing of itself known can be used as paints for paints, for example. For example, titanium oxide, a flower of zinc, lithopone, antimony white, carbon black, Acetylene black, lamp black, Naphthol Yellow S, Hansa Yellow, The pigment yellow L, benzidine yellow, permanent yellow, a chrome orange, Chrome Vermilion, a permanent orange, iron oxide, umber, red ocher, Red lead oxide, Permanent Red, quinacridone series red paints, cobalt purple, fast violet, Violet Lake, ultramarine, Prussian blue, cobalt blue, copper phthalocyanine blue, Solid color paints, such as indigo, chrome green, the pigment green B, and Phthalocyanine Green; Aluminum, Metallic pigment, such as flakes, such as an aluminum oxide, bismuth oxychloride, nickel, and copper, or a piece of vacuum evaporation, a mica flake, a titanium oxide covering mica flake, and an iron oxide covering mica flake, can be used conveniently.

[0013]Extenders, such as baryta powder, precipitated barium sulphate, barium carbonate, carbonic acid cull SIMM, gypsum fibrosum, clay, silica, white carbon, diatomaceous earth, talc, magnesium carbonate, an alumina white, a gloss white, and mica powder, etc. can be blended.

[0014]As for a base coating (A), it is preferred by making these color pigments contain that 20 micrometers or less of ground monochrome concealment thickness [ 15 micrometers or less of ] of the independent cured film are preferably adjusted so that it may be set to 13 micrometers or less still more preferably. Here, "ground monochrome concealment thickness" is the minimum hardening layer thickness in which paints a paint to the painted surface which has a monochrome lattice pattern, the coat is spaced through, and monochrome lattice pattern disappears.

[0015]A base coating (A) can be made to contain a hydrophilic organic solvent if needed further in addition to water. As a hydrophilic organic solvent which can be used in that case, It is included in 20 \*\* by the organic solvent which can dissolve 50 or more weight sections per water 100 weight section, and specifically, For example, acetic acid ethylene glycol monomethyl ether, acetic acid diethylene glycol monomethyl ether, Acetic acid diethylene glycol monoethyl ether, dioxane, ethylene glycol monomethyl ether, Ethylene glycol monoethyl

ether, ethylene glycol monobutyl ether, Diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, Diethylene-glycol diethylether, diethylene-glycol monobutyl ether, Propylene glycol monoethyl ether, dipropylene glycol monomethyl ether, Methyl alcohol, ethyl alcohol, allyl alcohol, n-propyl alcohol, Isopropyl alcohol, the 3rd butyl alcohol, ethylene glycol, 1,2-propylene glycol, a 1,3-butylene glycol, a 2,3-butylene glycol, hexylene glycol, hexandiol, dipropylene glycol, acetone, diacetone alcohol, etc. are raised. Among these, especially the solvent in which the boiling point is contained in within the limits which is 180-200 \*\* is preferred. As for the rate of a compounding ratio of a hydrophilic organic solvent, thermosetting resin ingredient 100 weight section (solid content) usually hits, and within the limits of 30 to 90 weight section is especially suitable 20 to 150 weight section.

[0016]An aquosity thermosetting base coating (A) can be prepared by carrying out mixture dispersion of the ingredients stated above, such as a thermosetting resin ingredient and a color pigment, to an aquosity medium, and, generally it is [ especially the solid content content at the time of paint ] preferred that there is 15 to 50 % of the weight in 18 to 35% of the weight of within the limits. At the time [ ratio / of water and a hydrophilic organic solvent ] of paint, based on the total weight of both this ingredient, It is suitable that there is water to 75 to 90%, and 30 to 5% of a hydrophilic organic solvent is in 25 to 10% of within the limits 50 to 0% 70 to 95% preferably 50 to 100%. In addition to the above-mentioned hydrophilic solvent, to a base coating (A), a hydrophobic organic solvent can be used together within limits which do not check the purpose of this invention, and it is the rate of a compounding ratio. It is preferred that they are especially 20 or less weight sections 30 or less weight sections per mixed liquor of hydrophilic organic solvent and water 100 weight section.

[0017]An aquosity thermosetting base coating (A) can be painted by methods, such as an air spray, airless spray, and electrostatic coating, to a coated object. Although the thickness reaches far and wide and can be changed depending on the purpose of using a coated product, etc., Usually, as ground concealment thickness, or more than it is preferred and 13 micrometers or less of 15 micrometers or less of 20 micrometers or less are still more preferably specifically suitable, for example preferably on the basis of the cured film.

[0018]According to this method, without painting an aquosity thermosetting base coating (A) as mentioned above, and making three dimensions carry out bridge construction hardening of the coat substantially in the state of un-hardening, After solid content content makes it dry 50 to 100% of the weight preferably 40% of the weight or more so that it may become 50 to 80% of the weight of within the limits more preferably, an aquosity metallic paint (B) is painted in the painted surface.

[0019]As a method of adjusting within the limits of the above, the solid content content of the non-cured film of a base coating (A), For example, solid content content allows to stand the coat formed using 40% of the weight or more of a base coating (A) at a room temperature, or

methods, such as carrying out for [ 1- 30 minutes ] grade artificial drying, are raised with about 50 - the temperature of 100 \*\* of abbreviation, and the latter artificial drying method is especially efficient, and preferred. In this method, when a metallic paint (B) is painted to the painted surface of the state where the solid content content of the coat of a base coating (A) is lower than 40 % of the weight, the stacking tendency of the metallic pigment included in this metallic paint (B) becomes uneven, and there is a tendency for ff nature and a precise feeling to fall moreover.

[0020]In accordance with this method, an aquosity metallic paint (B) is painted in the non-cured film side of the base coating (A) adjusted as mentioned above, and solid content content specifically, A thermosetting resin ingredient, metallic pigment, and water are contained as an essential ingredient, and the aquosity wet coating which blends coloring paints other than a hydrophilic organic solvent and metallic pigment, an extender, etc. can be used further if needed. As the thermosetting resin ingredient among the above-mentioned ingredients, and a hydrophilic organic solvent, it is aquosity. It is usable similarly in what was illustrated in explanation of a thermosetting base coating (A).

[0021]metallic pigment -- glitteringly -- the light interference nature paints etc. in which photoluminescent pigment and the light interference pattern which show the brightness carried out are shown are included. Specifically, flakes, such as aluminum, aluminum oxide, and oxybismuth chloride, nickel, and copper, or the piece of vacuum evaporation, a mica flake, a titanium oxide covering mica flake, an iron oxide covering mica flake, etc. can use it conveniently, for example. What has a longitudinal direction size in within the limits 1-100 micrometers of whose thickness [ 0.0001-5 micrometers of ] are 5-40 micrometers and are 0.001-2 micrometers especially especially as these metallic pigment is suitable.

[0022]Although the loadings of metallic pigment reach far and wide and can be changed depending on the purpose of using a final product, etc., generally, thermosetting resin ingredient 100 weight section (solid content) hits, and within the limits of five to 80 weight section is especially suitable three to 100 weight section. Within the limits of five to 10 weight section is usually especially suitable one to 20 weight section per thermosetting resin ingredient 100 weight section at the time [ rate / of a compounding ratio / of a hydrophilic organic solvent ] of paint. At the time [ ratio / of water and a hydrophilic organic solvent ] of paint, based on the total weight of both this ingredient, It is suitable that there is water to 75 to 90%, and 30 to 5% of a hydrophilic organic solvent is in 25 to 10% of within the limits 50 to 0% 70 to 95% preferably 50 to 100%.

[0023]To an aquosity metallic paint (B), it is also possible to use a hydrophobic organic solvent together in addition to the above-mentioned hydrophilic organic solvent, and, as for especially the content, it is preferred that they are 30 or less weight sections 50 or less weight sections per hydrophilic organic solvent 100 weight section.

[0024]One to 50% of the weight, the solid content content at the time of paint can be adjusted to 3 to 40% of the weight, and the aquosity metallic paint (B) can usually paint it by methods, such as an air spray, airless spray, and electrostatic coating, especially. Although the thickness is changeable according to the purpose of using a coated product, etc., especially generally 0.5-40 micrometers of within the limits of 1-20 micrometers are suitable.

[0025]By painting an aquosity thermosetting base coating (A), and painting an aquosity metallic paint (B) to the painted surface in this method, after drying the coat so that solid content content may be 40% of the weight or more, The moisture in the coat of an aquosity metallic paint (B), etc. are promptly absorbed in the coat of the aquosity thermosetting base coating (A) which adjoins a lower layer, as a result, it is easy to carry out orientation of the metallic pigment in parallel and precisely to the painted surface, and the effect that ff nature, brightness, etc. are moreover improved is done so.

[0026]In this method, it is preferred that the viscosity based on the rolling ball type viscosity determination of the double layer coat which consists of a non-cured film of an aquosity thermosetting base coating (A) and un-hardening of the aquosity metallic paint (B) recoated on it is within the limits of  $10^4 - 10^5$  centipoise.

[0027]A rolling ball type viscosity determination is performed by the following method about the two-layer coat which consists of a non-cured film of an aquosity thermosetting base coating (A), and un-hardening of the aquosity metallic paint (B) recoated on it.

[0028]Air spray painting of the aquosity thermosetting base coating (A) of 20 to 30 % of the weight of solid content content is carried out to a coated object with a cured film at 10-15 micrometers of thickness, Carry out artificial drying for 1 to 15 minutes at 70-80 \*\*, and solid content content is adjusted to 60 to 80% of the weight of within the limits, Subsequently, in [ when the aquosity metallic paint (B) of 20 to 30 % of the weight of solid content content is painted with a cured film to the painted surface at 7-13-micrometer thickness and it passes for 1 minute at 20 \*\* ] the temperature, Angle Costheta = it holds to two thirds and a steel ball the weight of  $0.45^{**}0.001$  g and  $0.48^{**}0.01$  cm in diameter is put on the painted surface, and it computes the viscosity of the double layer coat by a steel ball measuring the distance (cm) which rolled for 15 seconds, and applying the measured value to a following formula.

[0029] $\text{Log-cm}=5.48 - (1.08 \times \log \text{and centipoise})$

Since it will allow to stand less than for several minutes at a room temperature after painting an aquosity thermosetting base coating (A) and an aquosity metallic paint (B) if this method is followed, or after beyond a room temperature preheats at the temperature of less than 120 \*\*, a clear coating (C) is painted in the unhardened painted surface of a metallic paint (B).

[0030]The clear coating (C) painted in the painted surface which is not hardened [ of an aquosity metallic paint (B) ], It is water-white or the coat of colored transparency is formed, a thermosetting resin ingredient can be used as an essential ingredient, and, specifically, the

powder coatings or the wet coating which blends an organic solvent and/or water, a color pigment, an extender, etc. can be used further if needed.

[0031]The base resin which has functional groups, such as a hydroxyl group, a carboxyl group, and an epoxy group, as a thermosetting resin ingredient, for example, such as an acrylic resin, polyester resin, alkyd resin, and urethane resin, The thermosetting resin composition which consists of cross linking agents, such as melamine resin, the urea resin, blocked polyisocyanate compound and carboxyl containing compound which can react to these functional groups or resin, an epoxy group containing compound, or resin, is preferred. It is suitable that base resin is to 65 to 80% of the weight, and the rate of a compounding ratio of these both ingredients generally has 50 to 10 % of the weight of especially cross linking agents especially in 35 to 20% of the weight of within the limits 50 to 90% of the weight on the basis of such sum total solid content. As a color pigment, what was illustrated by explanation of an aquosity thermosetting base coating (A) can be used similarly. As an organic solvent, the organic solvent for paints of itself known can be used, the usual organic solvents, such as a hydrocarbon system, an alcohol system, an ester system, an ether system, and a ketone system, can be used concrete, for example, and it is usable in hydrophilic nature and hydrophobic either.

[0032]When using the wet coating containing an organic solvent and/or water as a clear coating (C), it is preferred to adjust especially the solid content content at the time of paint to 30 to 70% of the weight of within the limits 20 to 80% of the weight.

[0033]A clear coating (C) can be painted by methods, such as an air spray, airless spray, and electrostatic coating, to the non-cured film side of a metallic paint (B). Although the thickness is changeable according to the purpose of using a coated product, etc., it is usually suitable that there are 10-300 micrometers within the limits of 20-200 micrometers especially. this method -- after that and about 100- about 200 \*\* -- especially -- about 120- it can heat about 10 to 40 minutes at the temperature of about 160 \*\*, and the double layer coat by the base coating (A), the metallic paint (B), and a clear coating (C) can be stiffened together.

[0034]

[Effect of the Invention]According to this method, it is possible to excel in the stacking tendency and precise feeling of metallic pigment, and to form a double layer coat with good flip-flop nature, brightness, etc. Although the reason is not fully solved, by drying the non-cured film of an aquosity thermosetting base coating (A) for solid content content to 40% of the weight or more, It is imagined as that in which the metallic pigment which the absorptivity of moisture improves, absorbs promptly the moisture in the coat of the aquosity metallic paint (B) painted in the painted surface, and is included in the coat as a result carries out orientation in parallel and precisely to the film surface of a base coating (A).

[0035]

[Example] Hereafter, an example and a comparative example explain this invention still more concretely. In an example and a comparative example, the amount of solid content shows the loadings of the ingredient of each paint in principle, each of parts and % is weight references, and the thickness of a coat is a thing about a cured film further.

[0036] 1. The epoxy resin system cationic electrodeposition paint and the polyester melamine resin system intermediate coat were painted one by one to the steel plate (size of 400x300x0.8 mm) in which the sample carried out preparation 1 coated object degreasing and phosphoric acid zinc processing, and the coated steel sheet which carries out heat cure of each coat was used as a coated object.

[0037] 2) Aquosity thermosetting base coating (A)

75 copies of acrylic resins (notes 1), 25 copies of melamine resin (notes 2), 1.5 copies of carbon black pigments, and 80 copies of titanium white pigments are uniformly mixed into the mixed liquor which consists of ethylene-glycol-monobutyl-ether 20% and 80% of water, It prepared at viscosity 40 second /, 20% of solid content content, and Ford cup #4 / 20 \*\*.

Ground monochrome concealment thickness is 15 micrometers.

[0038] (Note 1) Acrylic resin : it is a copolymer of the monomer component which consists of methyl methacrylate, ethyl acrylate, n-butyl acrylate, hydroxyethyl methacrylate, lauryl methacrylate, and acrylic acid, and they are the hydroxyl value 50, the acid value 70, and the number average molecular weight 50000. It neutralized by monoethanolamine.

[0039] (Note 2) Melamine resin : partial methyl ether-ized melamine resin.

[0040] 3) Aquosity metallic paint (B)

15 copies of aluminum paints for distemper, 75 copies of acrylic resins (notes 1), and 25 copies of melamine resin (notes 2) were uniformly mixed into the mixed liquor which consists of ethylene-glycol-monobutyl-ether 20% and 80% of water, and it prepared at viscosity 30 second /, 20% of solid content content, and Ford cup #4 / 20 \*\*.

[0041] 4) Clear coating (C)

50 copies of carboxyl containing acrylic resin (notes 4), 50 copies of epoxy group containing acrylic resin (notes 5), "Tinuvin 900" (the Ciba-Geigy make, trade names, ultraviolet ray absorbent) One copy, One copy of tetrabutylammonium star's picture, and "BYK300" (the product made by big HEMI, trade names, surface control material) 0.1 copy was mixed to the solvent solution which consists of "SUWAZORU 1000", and it prepared at viscosity 20 second /, Ford cup #4 / 20 \*\*.

[0042] (Note 4) Carboxyl containing acrylic resin : the copolymer of the monomer which consists of 20 copies of 20 copies of acrylic acid, and acrylic acid 4-hydroxy n-butyl, 40 copies of n-butyl acrylate, and 20 copies of styrene. The number average molecular weight 3500, the acid value 86, the hydroxyl value 78.

[0043] (Note 5) Epoxy group containing acrylic resin : the copolymer of the monomer which

consists of 30 copies of glycidyl methacrylate, 20 copies of acrylic acid 2-hydroxy n-butyl, 30 copies of n-butyl acrylate, and 20 copies of styrene. Number average molecular weight 3000 and epoxy group content 2.1 millimol /g, the hydroxyl value 78.

[0044]2. Example and comparative example Air spray painting of the aquosity thermosetting base coating (A) of 20 % of the weight of solid content content was carried out to one coated object so that it might be set to thickness 10 mum with a cured film, artificial drying of the coat was carried out for 5 minutes at 70 \*\*, and solid content content was made into 70 % of the weight. Subsequently, when it passes for 60 seconds at 20 \*\*, the color card which painted the aquosity metallic paint (B) of 20 % of the weight of solid content content to the painted surface at 7-micrometer thickness at the temperature. Angle Costheta = it was 1.9 cm, when it held to two thirds, a steel ball the weight of 0.45\*\*0.001 g and 0.48\*\*0.01 cm in diameter was put on the unhardened painted surface and the steel ball measured the distance which rolled for 15 seconds. And they were 65000 centipoises when asked for the viscosity of the double layer coat according to the following formula.

[0045] $\text{Log. } 1.9\text{cm} = 5.48 - (1.08 \times \log \text{ and centipoise})$

Subsequently, the clear coating (C) was painted to 40 micrometers of thickness in this unhardened painted surface, it heated at 140 \*\* for 30 minutes after allowing to stand for 7 minutes at a room temperature, and bridge construction hardening of the three-layer coat is carried out simultaneously.

[0046]The obtained double layer coat was excellent in the stacking tendency and precise feeling of metallic pigment, and, moreover, flip-flop (ff) nature, its brightness, etc. were good.

[0047]Comparative example Air spray painting of the aquosity thermosetting base coating (A) of 20 % of the weight of solid content content was carried out to one coated object so that it might become 10 micrometers of thickness with a cured film, the coat was allowed to stand for 2 minutes at the room temperature, and solid content content was made into 30 % of the weight. Subsequently, when it passes for 60 seconds at 20 \*\*, the color card which painted the aquosity metallic paint (B) of 20 % of the weight of solid content content to the painted surface at 7-micrometer thickness at the temperature. Angle Costheta = it was 82 cm, when it held to two thirds, a steel ball the weight of 0.45\*\*0.001 g and 0.48\*\*0.01 cm in diameter was put on the unhardened painted surface and the steel ball measured the distance which rolled for 15 seconds. And they were 2000 centipoises when asked for the viscosity of the double layer coat according to the following formula.

[0048] $\text{Log. } 82\text{cm} = 5.48 - (1.08 \times \log \text{ and centipoise})$

Subsequently, the clear coating (C) was painted to 40 micrometers of thickness in this unhardened painted surface, it heated at 140 \*\* for 30 minutes after allowing to stand for 3 minutes at a room temperature, and bridge construction hardening of the three-layer coat is carried out simultaneously.

[0049]The obtained double layer coat was inferior in the stacking tendency and precise feeling of metallic pigment, and, moreover, flip-flop (ff) nature, its brightness, etc. were not enough.

[0050]Comparative example Air spray painting of the aquosity thermosetting base coating (A) of 20 % of the weight of solid content content was carried out to two coated objects so that it might become 10 micrometers of thickness with a cured film, and at 140 \*\*, the coat was heated for 30 minutes and hardened. Subsequently, when it passes for 60 seconds at 20 \*\*, the color card which painted the aquosity metallic paint (B) of 20 % of the weight of solid content content to the painted surface at 7-micrometer thickness at the temperature. Angle Costheta = it was 170 cm, when it held to two thirds, a steel ball the weight of 0.45\*\*0.001 g and 0.48\*\*0.01 cm in diameter was put on the unhardened painted surface and the steel ball measured the distance which rolled for 15 seconds. And they were 1000 centipoises when asked for the viscosity of the double layer coat according to the following formula.

[0051] $\text{Log.} 170\text{cm}=5.48 - (1.08 \times \text{log and centipoise})$

Subsequently, the clear coating (C) was painted to 40 micrometers of thickness in this unhardened painted surface, it heated at 140 \*\* for 30 minutes after allowing to stand for 3 minutes at a room temperature, and bridge construction hardening of the three-layer coat is carried out simultaneously.

[0052]The obtained double layer coat was inferior in the stacking tendency and precise feeling of metallic pigment, and, moreover, flip-flop (ff) nature, its brightness, etc. were not enough.

[0053]The measurement result of the stacking tendency (IV value) of the metallic pigment of a double layer coat and ff nature formed of an above-mentioned example and comparative example is as follows.

[0054]

[Table 1]

	実施例		比較例	
	1	1	2	
I V 値	3 9 0	2 8 0	3 0 0	
f f 性	1. 7 8	1. 6 9	1. 7 1	

[0055]IV value is a Y value of the highlight (15 degrees) measured using the "alcove" (the Kansai Paint Co., Ltd. make, trade name). The stacking tendency of the one where a numerical value is larger is good, and a maximum is 400.

[0056]ff nature computes the Y value a of 15 degrees measured using the "alcove" (the Kansai Paint Co., Ltd. make, trade name), and the Y value b of 45 degrees by applying them to a following formula, ff nature is so good that a numerical value is large, and a maximum is 2.00.

[0057] $\text{ff}=(a-b)/[(a+b)/2]$

[Translation done.]